

**REMARKS****Status of the Claims**

Claims 1, 3, 5-17, 19, 21-33, 35, 37-48 are currently present in the Application, and claims 1, 14, 17, 30, 33, and 46 are independent claims. Claims 1, 3, 5, 14, 16, 17, 19, 21, 30, 32, 33, 35, 37, 39-44, 46, and 48 have been amended, claims 2, 4, 18, 20, 34, and 36 have been cancelled, and no claims have been added in this Amendment. Applicants are not conceding in this Application that those claims are not patentable over the art cited by the Examiner, as the present claim amendments and cancellations are only for facilitating expeditious prosecution of the allowable subject matter noted by the Examiner. Applicants respectfully reserve the right to pursue these and other claims in one or more continuation and/or divisional patent applications.

In particular, Applicants have amended independent claims 1, 17, and 33 to include limitations previously found in dependent claims 2 and 4, 18 and 20, and 34 and 36, respectively, and have therefore canceled claims 2, 4, 18, 20, 34 and 36. Similarly, Applicants have amended independent claims 14, 30, and 46 to include limitations previously found in dependent claims 16, 32, and 48, respectively, and have amended claims 16, 32, and 48 accordingly.

**Examiner Interview**

Applicants note with appreciation the Examiner interview conducted between Examiner Kawsar and Applicants' attorney on September 26, 2007. During the interview, Applicants' attorney pointed out that the § 102 prior art reference does not teach each and every limitation set forth in Applicants' original independent claims and the Examiner seemed to agree with this position. However, the Examiner and Applicants' attorney discussed amendments that could be made to the claims in order to clarify and more distinctly claim Applicants' invention. These amendments have been made by the Applicants in the instant Amendment and Response. Because the amendments are essentially re-presenting former claims 4, 20, and 36 in independent form and made in order to clarify and more distinctly claim Applicants' invention,

Applicants' attorney stated that it would be improper for a Final Office Action to be issued in the next Office Communication if such Final Office Action relied upon new art, to which the Examiner agreed.

### **Drawings**

Applicants note with appreciation the acceptance, by the Examiner, of Applicants' formal drawings that were submitted with the application.

### **Specification Objections**

The Office Action objected to use of the acronym "CPI" in the abstract without it being spelled out. Applicants reviewed MPEP § 608.01(b) and did not locate any requirement for spelling out acronyms. Nonetheless, Applicants' have amended the abstract to spell out the first occurrence of "CPI" as meaning "cycles per instruction." Accordingly, Applicants respectfully request that the Examiner withdraw the objection to the specification in the next Office Communication.

### **Claim Objections**

The Office Action objected to the user of the acronym "CPI" in the claims. During the telephone interview, the Examiner noted that this objection was in error and that the CPI acronym was properly spelled out in the claims. Instead, the Examiner noted in the telephone interview that the acronym "SMT" was not spelled out in the claims. Accordingly, Applicants have amended each of the independent claims to clarify that the acronym "SMT" means "Simultaneous Multi-Threading." Accordingly, Applicants respectfully request that the Examiner withdraw the objection to the claims in the next Office Communication.

### **Claim Rejections - Alleged Anticipation Under 35 U.S.C. § 102**

Claims 1, 3, 7-8, 16-17, 19, 23-24, 32-33, 35, 39-40, and 48 stand rejected under 35 U.S.C. § 102(a) as allegedly being anticipated, and therefore unpatentable, over an article by Fowler et al. titled "Using Performance Reflection in Systems Software" (hereinafter "Fowler"). Applicants respectfully traverse the rejections.

The Office bears the burden of showing that a claim is anticipated by a reference being used to reject a claim under 35 U.S.C. § 102. MPEP § 2131 states:

**TO ANTICIPATE A CLAIM,  
THE REFERENCE MUST TEACH EVERY ELEMENT OF THE CLAIM**

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). >"When a claim covers several structures or compositions, either generically or as alternatives, the claim is deemed anticipated if any of the structures or compositions within the scope of the claim is known in the prior art." *Brown v. 3M*, 265 F.3d 1349, 1351, 60 USPQ2d 1375, 1376 (Fed. Cir. 2001) (claim to a system for setting a computer clock to an offset time to address the Year 2000 (Y2K) problem, applicable to records with year date data in "at least one of two-digit, three-digit, or four-digit" representations, was held anticipated by a system that offsets year dates in only two-digit formats). See also MPEP § 2131.02.< "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990). Note that, in some circumstances, it is permissible to use multiple references in a 35 U.S.C. 102 rejection. See MPEP § 2131.01.

Applicants respectfully submit that, as described below and as discussed during the Examiner interview, Fowler fails to teach each and every element of Applicants' claimed invention. Limitations of original claim 4 (which depended on original claim 2) and original claim 2 (which depended on original claim 1) have been incorporated in amended independent claim 1 to clarify Applicants' claimed invention and claims 2 and 4 have been canceled. Likewise, independent claims 17 and 33 have been similarly amended with dependent claims 18, 20, 34, and 36 being canceled. Taking claim 1 as an exemplary claim of independent claims 1, 17, and 33, as amended claim 1 is directed to a method of identifying compatible software threads to execute on a Simultaneous Multi-Threading (SMT) processor, said method comprising:

- identifying a time interval during which both a first thread and a second thread are executing on the SMT processor;
- retrieving a performance value that is a cycles per instruction (CPI) value and that occurred during the identified time interval;
- determining, based upon the retrieved performance value, whether the first thread is compatible with the second thread, wherein the determining includes comparing the CPI value to a threshold value, wherein the first thread and second thread are determined to be compatible if the CPI value is better than the threshold value; and
- recording the compatibility of the first thread with the second thread in response to the determination.

The Office Action cites Fowler as teaching the limitation of “identifying a time interval during which both a first thread and a second thread are executing on the SMT processor;” citing page 2, col. 1, lines 24-27. However, Fowler is merely reciting that the cycles per instruction is a common measure of productivity and never teaches or suggests identifying when two threads are executing on an SMT processor. Indeed, Fowler mentions a multi-threaded network server at the bottom of page 2/col. 1 but this is in the context of identifying a “number of requests served” as a progress measurement. Fowler simply does not teach or suggest, in the cited section or elsewhere, identifying an interval when two threads are executing on an SMT processor.

Next, because Fowler fails to teach or suggest identifying the time interval when two threads are executing, it follows that Fowler does not teach or suggest “retrieving a performance value that occurred during the identified time interval;” as claimed by Applicants. Instead, the Office Action simply points to general well-known performance statements found in Fowler (metrics are used to estimate productivity, general ways that performance metrics are gathered). In particular, the Office Action cites Fowler at page 2, col. 1 lines 3-4 where Fowler merely states “We use these metrics to estimate *productivity*.” (emphasis in original). However, Fowler does not teach or suggest

retrieving any performance value that occurred when two particular threads are executing because Fowler, as explained above, does not teach identifying such a time interval.

Finally, the Office Action contends that Fowler teaches Applicants' limitation of "determining, based upon the retrieved performance value, whether the first thread is compatible with the second thread, wherein the determining includes comparing the CPI value to a threshold value, wherein the first thread and second thread are determined to be compatible if the CPI value is better than the threshold value," citing Fowler at page 2, col. 2 for the non-underlined portion and page 1, col. 1, lines 6-10 for the underlined portion that was previously found in original claim 4. The cited portion at page 2, col. 2 of Fowler states "While it would not save the cost of the extra processors, monitoring miss rates of the shard cache of a standard node would enable the system to either schedule only one thread per module or to possibly identify "compatible" threads to co-schedule." This section of Fowler is discussing memory hierarchy performance in non-SMT processors (in particular cache misses), while Applicants' limitation is directed to threads with compatible cycles per instruction (CPI) values that can be treated as compatible in SMT processors. Indeed, the section of Fowler is titled "3.1 Memory Hierarchy Performance."

As mentioned above, the underlined portion of this limitation ("wherein the determining includes comparing the CPI value to a threshold value, wherein the first thread and second thread are determined to be compatible if the CPI value is better than the threshold value") was previously presented in claim 4. The Office Action contends that Fowler teaches this limitation citing page 1, col. 1, lines 6-10. However, this section of Fowler (the abstract), only introduces general discussion points of the Fowler article and never teaches or suggests using CPI values as taught and claimed by Applicants. In particular, at page 1, col. 1, lines 6-10 Fowler states: "In this paper we outline our approach of using these instrumentation mechanisms to estimate *productivity* and *overhead* metrics while running user applications. At the kernel level, we speculate that the scheduler can exploit these metrics to improve system

performance” (emphasis in original). However, as can be seen from the cited portion, Fowler never teaches “comparing the CPI value to a threshold value” nor does Fowler ever teach that two threads “are determined to be compatible if the CPI value is better than the threshold value,” both as taught and claimed by Applicants.

As shown by the above Remarks, Fowler simply does not teach any of Applicants’ claim limitations as set forth in independent claims 1, 17, and 33 and Fowler falls considerably short of the burden set forth MPEP § 2131 which requires that the prior art reference teach every element of Applicants’ claimed invention. Consequently, Applicants’ claimed invention as set forth in independent claims 1, 17, and 33 is allowable over Fowler. Claims 3 and 5-13 each depend, directly or indirectly, on independent claim 1 and therefore are allowable for at least the same reasons that independent claim 1 is allowable. Claims 19 and 21-32 each depend, directly or indirectly, on independent claim 17 and therefore are allowable for at least the same reasons that independent claim 17 is allowable. Finally, claims 35 and 37-45 each depend, directly or indirectly, on independent claim 33 and therefore are allowable for at least the same reasons that independent claim 33 is allowable.

#### **Claim Rejections – Alleged Obviousness Under 35 U.S.C. § 103**

Claims 9, 12, 14, 25, 28, 30, 41, 44, and 46 stand rejected under 35 U.S.C. § 103 as allegedly being obvious, and therefore unpatentable, over Fowler in view of U.S. Patent No. 5,963,911 to Walker et al. (hereinafter “Walker”). Applicants respectfully traverse the rejections. Applicants note that claims 14, 30 and 46 are independent claims and the remaining claims (9, 12, 25, 28, 41, and 44) are dependent claims. Applicants further note that claims 15, 31, and 47 which depend on claims 14, 30, and 46, respectively, were rejected as being obvious in light of Fowler in view of U.S. Patent No. 6,549,930 to Chrysos et al. (hereinafter “Chrysos”) and somehow not in light of Walker. Applicants fail to understand how the independent claims are rejected in light of references not used to reject the dependent claims. Likewise, dependent claims 16, 32, and 48 which also depend on independent claims 14, 30, and 46, respectively, were rejected under § 102 as being anticipated by Fowler while their independent claims

were rejected under § 103 as being obvious in light of Fowler in view of Walker. Applicants fail to understand how the dependent claims can be anticipated by a single reference when the independent claims from which they depend are rejected as being obvious in light of a pair of references.

Taking claim 14 as an exemplary claim of claims 14, 30, and 46, is a computer-implemented method of dispatching software threads to execute on a Simultaneous Multi-Threading (SMT) processor, said method comprising:

- sensing that a completing thread that is about to complete execution on the SMT processor;
- identifying a running thread that is still executing on the SMT processor;
- checking a list of one or more compatible threads, wherein the compatible threads are compatible with the running thread, and wherein the compatibility is based on a comparison of a first cycles per instruction (CPI) value corresponding to the running thread with one or more CPI values corresponding to each of the listed compatible threads;
- determining that one of the compatible threads is ready to execute; and
- dispatching the determined thread to execute on the SMT processor.

The Office Action states that “Fowler discloses all the elements of claim 14 except, sensing that a completing thread that is about to complete execution.” However, the Office Action never explains how or where Fowler teaches or suggests “identifying a running thread that is still executing on the SMT processor;” “checking a list of one or more compatible threads, wherein the compatible threads are compatible with the running thread, and wherein the compatibility is based on a comparison of a first cycles per instruction (CPI) value corresponding to the running thread with one or more CPI values corresponding to each of the listed compatible threads;” “determining that one of the compatible threads is ready to execute;” and “dispatching the determined thread to execute on the SMT processor.” Consequently, Applicants respectfully submit that the Office Action has failed to establish a *prima facie* case of obviousness for

claims 14, 30, and 44. Accordingly, claims 14, 30, and 44 are each allowable over Fowler in view of Walker.

Claims 15 and 16 each depend on independent claim 14 and, therefore are each allowable for at least the same reasons that claim 14 is allowable. Likewise, Claims 31 and 32 each depend on independent claim 30 and, therefore are each allowable for at least the same reasons that claim 30 is allowable. Finally, claims 47 and 48 each depend on independent claim 46 and, therefore are each allowable for at least the same reasons that claim 46 is allowable.

### **Conclusion**

As a result of the foregoing, it is asserted by Applicants that the remaining claims in the Application are in condition for allowance, and Applicants respectfully request an early allowance of such claims.

Applicants respectfully request that the Examiner contact the Applicants' attorney listed below if the Examiner believes that such a discussion would be helpful in resolving any remaining questions or issues related to this Application.

Respectfully submitted,

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